Application No. 10/064,160
Attorney Docket No. 33-XZ-121612 (13494US02)

REMARKS

The present application includes claims 1-31. Claims 1-31 were rejected. Claims 1, 9 and 16 are amended in response to Examiner's rejections.

Claims 1 and 16 are amended to recite the limitation of x-ray source and receptor brackets moving at least one of an x-ray source and receptor in a radial direction toward and away from a central axis of a C-arm unit to maintain a desired distance between the x-ray source and receptor.

Claim 9 is amended to recite the additional limitation of radially moving at least one of an x-ray source and receptor to first radial distances from a central axis when at a first scan angle and radially moving the at least one of the x-ray source and receptor to second radial distances from the central axis when at a second scan angle, where a desired distance is maintained between the x-ray source and receptor at the first and second radial distances.

Claims 1-4, 9-16, 19, 21-26 and 29-31 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuo-Pettravic et al., U.S. Patent No. 5,375,156, in view of Kobayashi, U.S. Patent No. 5,095,501.

Claims 5-8, 17-18, 20 and 27-28 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kuo-Pettravic as modified by Kobayashi and further in view of Schmitz, et al., U.S. Patent No. 6,050724.

The Applicant first turns to the rejection of claims 1-4, 9-16, 19, 21-26 and 29-31 under 35 U.S.C. § 103(a) as being unpatentable over Kuo-Pettravic in view of Kobayashi. Kuo-Pettravic describes a method and apparatus for 3-D computer tomography. Specifically, Kuo-Pettravic describes three C-arms that each move one of three x-ray source and detector pairs in three orthogonal, or perpendicular, directions (col. 6, lines 3-42). That is, the x-ray system describes three C-arms that each move an x-ray source and detector along a circular path, where the circular path of each arm is perpendicular to the circular paths of the other two C-arms (col. 6, lines 3-42). In addition, the source and detector of each C-arm in Kuo-Pettravic are fixed to the ends of the C-arm (col. 5, lines 16-49).

Applicant respectfully agrees with the Examiner that Kuo-Pettravic fails to teach moving at least one of an x-ray source and receptor in a radial direction. (Office Action mailed Dec. 22, 2003, pp. 3, 5, 8-9). In addition, Kuo-Pettravic fails to teach x-ray source and receptor brackets moving at least one of an x-ray source and receptor in a radial direction toward and away from a central axis of a C-arm unit to maintain a desired distance between the x-ray source and receptor. Kuo-Pettravic also fails to teach radially moving at least one of an x-ray source and receptor to first radial distances from a central axis when at a first scan angle and radially moving the at least one of the x-ray source and receptor to second radial distances from the central axis when at the second scan angle, where a desired distance is maintained between the x-ray source and receptor at the first

and second radial distances. Furthermore, Kuo-Pettravic fails to teach x-ray source and receptor brackets moving an x-ray source and receptor to maintain a central axis for a series of image exposures. Kuo-Pettravic also fails to teach moving an x-ray source and receptor to first distances to maintain a central axis when at a first scan angle and moving the x-ray source and receptor to second distances to maintain the central axis when at a second scan angle. Conversely, Kuo-Pettravic describes a system in which the x-ray source and receptor are fixed in position and may not be moved in a radial direction at all.

Thus, the Applicant respectfully submits that Kuo-Pettravic does not teach or suggest the limitations of the claimed invention.

Kobayashi describes an x-ray image-pickup apparatus. Specifically, Kobayashi describes a ring of an x-ray apparatus that includes two x-ray source and detector pairs (col. 4, lines 47-55). Both the source and detector are slide-able in linear directions (col. 4, lines 51-59). Kobayashi also describes two memories for storing dimensions of a room and a minimum distance to which the various components of the x-ray apparatus can approach the subject (col. 5, lines 36-39). As the various components of the x-ray apparatus are moved in preparation for x-ray exposure, the computer determines the position of the apparatus and compares this position to the dimensions of the room and to the minimum distance to the subject (col. 6, lines 17-68; col. 7, lines 1-8). If the apparatus encroaches on the minimum distance to the subject, an alarm sounds (col. 6, lines 38-42, 65-68). In this way, Kobayashi describes an x-ray apparatus that maintains a

minimum distance from a subject to ensure that the subject is not struck or interfered with by the x-ray apparatus.

Kobayashi does not teach x-ray source and receptor brackets moving at least one of an x-ray source and receptor in a radial direction toward and away from a central axis of a C-arm unit to maintain a desired distance between the x-ray source and receptor. In addition, Kobayashi does not teach radially moving at least one of an x-ray source and receptor to first radial distances from a central axis when at a first scan angle and radially moving at least one of the x-ray source and receptor to second radial distances from the central axis when at a second scan angle, where a desired distance is maintained between the x-ray source and receptor at the first and second radial distances. Conversely, Kobayashi describes an apparatus that seeks to avoid encroaching on a minimum distance to a patient (col. 5, lines 37-39; col. 6, lines 38-42, 65-68). In this way, Kobayashi does not teach a system that maintains a desired distance between an x-ray source and receptor. The apparatus of Kobayashi does not seek to maintain any distance at all, but instead seeks to avoid encroaching on a desired distance (col. 5, lines 37-39; col. 6, lines 38-42, 65-68). That is, Kobayashi does not seek to maintain any distance between the x-ray source and receptor, but instead seeks to maintain a minimum distance between the various components of an x-ray apparatus and a patient (col. 5, lines 37-39; col. 6, lines 38-42, 65-68).

Kobayashi also does not teach x-ray source and receptor brackets moving an x-ray source and receptor to maintain a central axis for a series of image exposures. Kobayashi

additionally does not teach moving an x-ray source and receptor to first distances to maintain a central axis when at a first scan angle and moving the x-ray source and receptor to second distances to maintain the central axis when at a second scan angle. Kobayashi does not describe, in any form, maintaining any central axis. Conversely, as described above, Kobayashi merely describes maintaining a minimum distance between an apparatus and a patient to avoid contact between the apparatus and the patient (col. 5, lines 37-39; col. 6, lines 38-42, 65-68). Therefore, Kobayashi is not concerned with maintaining any axis whatsoever, but is instead concerned with avoiding contact between the patient and the apparatus (col. 5, lines 37-39; col. 6, lines 38-42, 65-68).

Claims 25 and 29 recite the limitation of moving an x-ray source and receptor to maintain a central axis.

Thus, the Applicant respectfully submits that Kobayashi does not teach or suggest the limitations of the claimed invention.

Kobayashi does not remedy the shortcomings of Kuo-Pettravic as described above, either alone or in combination, as neither describe moving at least one of an x-ray source and receptor to maintain a desired distance between an x-ray source and receptor. In addition, neither Kobayashi nor Kuo-Pettravic describes moving an x-ray source and receptor to maintain a central axis. Assuming for the sake of argument that one would combine Kuo-Pettravic and Kobayashi, the combination would result in an x-ray apparatus with three C-arms that each move one of three x-ray source and detector pairs

in three orthogonal directions and a memory that stores a minimum distance from a patient, where the apparatus would move the three C-arms and source/detector pairs to avoid encroaching on the minimum distance stored in the memory. Thus, the Applicant respectfully submits a combination of Kuo-Pettravic and Kobayashi does not teach or suggest limitations of the claimed invention.

The present rejection encompasses claims 1-4, 9-16, 19, 21-26 and 29-31. Claims 1, 9 and 16 are amended to recite a limitation not taught by either Kuo-Pettravic or Kobayashi, alone or in combination. In addition, claims 25 and 29 recite a limitation not taught by either Kuo-Pettravic or Kobayashi, alone or in combination. As claims 2-4, 10-15, 19, 21-24, 26 and 30-31 depend from claims 1, 9 and 16, Applicant respectfully submits that claims 2-4, 10-15, 19, 21-24, 26 and 30-31 recite limitations that are not taught by either Kuo-Pettravic or Kobayashi, alone or in combination. Consequently, Applicant respectfully submits that claims 1-4, 9-16, 19, 21-26 and 29-31 should be allowable.

The Applicant next turns to the rejection of claims 5-8, 17-18, 20 and 27-28 under 35 U.S.C. § 103(a) as being unpatentable over Kuo-Pettravic as modified by Kobayashi and further in view of Schmitz. Schmitz describes a method of and device for position detection in x-ray imaging. Specifically, Schmitz describes an x-ray apparatus that includes infrared cameras on an x-ray image pick-up and intensifier device located

opposite an x-ray source (col. 5, lines 32-37; FIG. 1). A patient table is located between the infrared cameras on the image pick-up and intensifier device and the x-ray source (FIG. 1). Three light emitting diodes are located on the patient table and emit infrared light in the direction of the infrared cameras (col. 5, lines 37-52). A detector coordinate system then determines, using positions determined by the cameras and diodes, the three-dimensional position of an object point, an interventional medical apparatus or a radiation therapy apparatus (col. 7, lines 17-28; col. 7, lines 61-68; col. 8, lines 1-18).

Conversely, Schmitz does not teach moving at least one of an x-ray source and receptor in a radial direction toward and away from a central axis of a C-arm unit to maintain a desired distance between the x-ray source and receptor. In addition, Schmitz does not teach moving an x-ray source and receptor to maintain a central axis. Instead, as described above, Schmitz describes the use of infrared cameras located on an image pick-up and intensifier device and infrared light emitting diodes on a patient table to determine the three-dimensional position of an object point or medical apparatus (col. 7, lines 17-28; col. 7, lines 61-68; col. 8, lines 1-18). That is, Schmitz does not describe any movement, whatsoever, of either an x-ray source or receptor in order to maintain a desired distance between the source and receptor or to maintain a central axis.

As described above, claims 1 and 16 are amended to recite the additional limitation of moving at least one of an x-ray source and receptor in a radial direction toward and away from a central axis of a C-arm unit to maintain a desired distance

between the x-ray source and receptor. In addition, claim 25 recites the limitation of moving an x-ray source and receptor to maintain a central axis.

Thus, the Applicant respectfully submits that Schmitz does not teach or suggest the limitations of the claimed invention.

As described above, Kuo-Pettravic describes a method and apparatus for 3-D computer tomography. Also as described above, Kobayashi describes an x-ray image-pickup apparatus. Kuo-Pettravic and Kobayashi do not remedy the shortcomings of Schmitz as described above, either alone or in combination, as none describe moving at least one of an x-ray source and receptor in a radial direction toward and away from a central axis of a C-arm unit to maintain a desired distance between the x-ray source and receptor. In addition, neither Kuo-Pettravic, Kobayashi nor Schmitz describe moving an x-ray source and receptor to maintain a central axis. Assuming for the sake of argument that one would combine Kuo-Pettravic, Kobayashi and Schmitz, the combination would result in an x-ray apparatus with three C-arms that each move one of three x-ray source and detector pairs in three orthogonal directions, a memory that stores a minimum distance from a patient, a pair of infrared cameras attached to the x-ray detectors and several light emitting diodes attached to a patient table. In operation, this apparatus would move the three C-arms and source/detector pairs to avoid encroaching on the minimum distance to the patient. In addition, the infrared cameras and diodes would

operate to determine the three-dimensional position of an object point, an interventional medical apparatus or a radiation therapy apparatus.

Thus, the Applicant respectfully submits a combination of Kuo-Pettravic, Kobayashi and Schmitz do not teach or suggest limitations of the claimed invention.

The present rejection encompasses claims 5-8, 17-18, 20 and 27-28. Claims 1 and 16 have been amended to recite limitations not taught by any of Kuo-Pettravic, Kobayashi or Schmitz, alone or in combination. Claim 25 recites a limitation not taught by Kuo-Pettravic, Kobayashi or Schmitz, alone or in combination. As claims 5-8, 17-18, 20 and 27-28 depend from claims 1, 16 and 25, Applicant respectfully submits that claims 5-8, 17-18, 20 and 27-28 recite limitations that are not taught by any of Kuo-Pettravic, Kobayashi or Schmitz, alone or in combination. Consequently, Applicant respectfully submits that claims 5-8, 17-18, 20 and 27-28 should be allowable.

Therefore, the Applicant respectfully submits that the claims of the present application should be allowable over the prior art.

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CONCLUSION

The Applicant respectfully submits that all claims of the present invention should be in condition for allowance. If the Examiner has any questions or the Applicant can be of any assistance, the Examiner is invited and encouraged to contact the Applicant at the number below.

The Commissioner is authorized to charge any necessary fees or credit any overpayment to the Deposit Account of GTC, Account No. 070845.

Respectfully submitted,

Date: February 25, 2004

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